

# NASA Aeronautics

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# **NASA's Aeronautics Programs**

- **Fundamental Aeronautics Program**
  - Hypersonics
  - Supersonics
  - Subsonics: Fixed Wing
  - Subsonics: Rotary Wing
- **Aviation Safety Program**
  - Integrated Vehicle Health Management
  - Integrated Resilient Aircraft Control
  - Integrated Intelligent Flight Deck
  - Aircraft Aging & Durability
- **Airspace Systems Program**
  - NGATS Air Traffic Management: Airspace
  - NGATS Air Traffic Management: Airportal
- **Aeronautics Test Program**
  - Ensure the strategic availability and accessibility of a critical suite of aeronautics test facilities that are deemed necessary to meet aeronautics, agency, and national needs.

# **Aeronautics Program's Wx Needs**

- **Fundamental Aeronautics Program**

- Hypersonics

- **Supersonics**

- **Subsonics: Fixed Wing**

- **Subsonics: Rotary Wing**

- **Aviation Safety Program**

- **Integrated Vehicle Health Management**

- Integrated Resilient Aircraft Control

- **Integrated Intelligent Flight Deck**

- Aircraft Aging & Durability

- **Airspace Systems Program**

- **NGATS Air Traffic Management: Airspace**

- **NGATS Air Traffic Management: Airportal**

- **Aeronautics Test Program**

- Ensure the strategic availability and accessibility of a critical suite of aeronautics test facilities that are deemed necessary to meet aeronautics agency, and national needs.

# Subsonic Fixed Wing

**If climate concerns limit operations <27K ft ...**

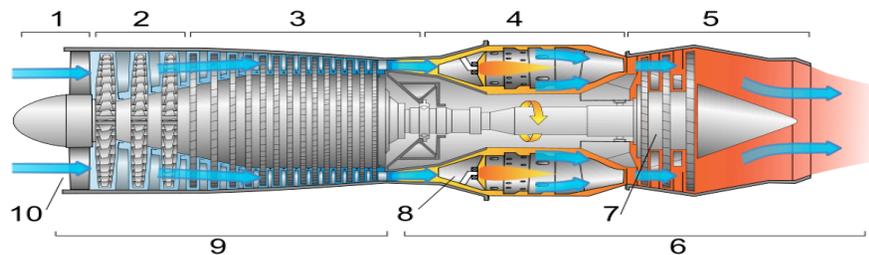
- Low-level convection for active ride control
- Icing conditions - Laminar flow wing
- Wind profiles

**Wx observations/forecasts at untowered airports**



**Environmental constraints on operations**

- Noise propagation predictions (on board)
  - Temperature profiles
  - Winds
- Combustion products



# **Subsonic Rotary Wing**

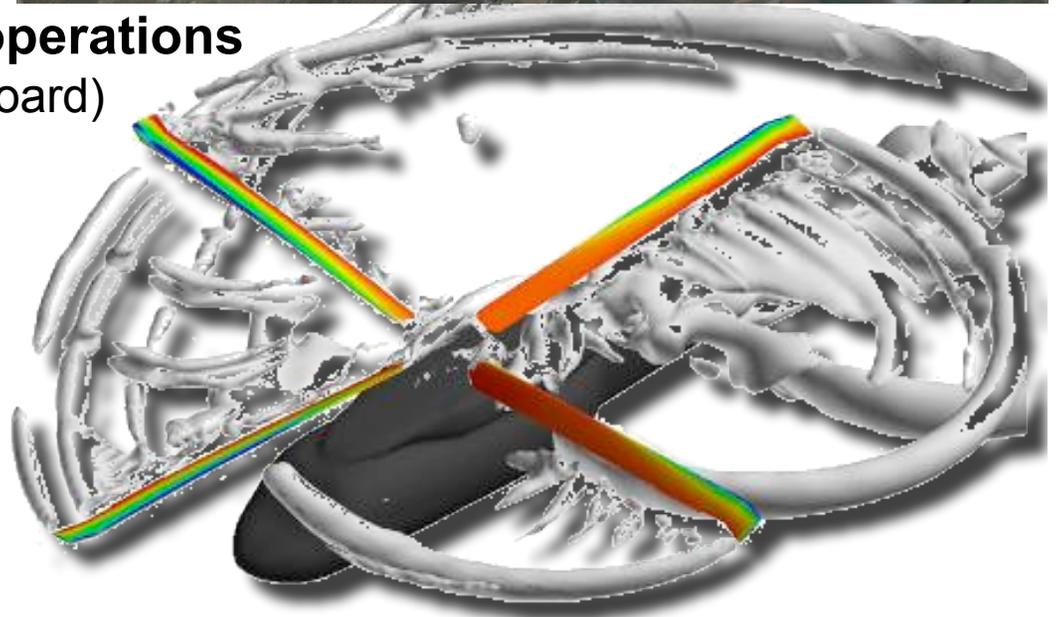
## **Mostly Low-altitude VFR**

- Clouds below 10K ft
- Icing
- Visibility



## **Environmental constraints on operations**

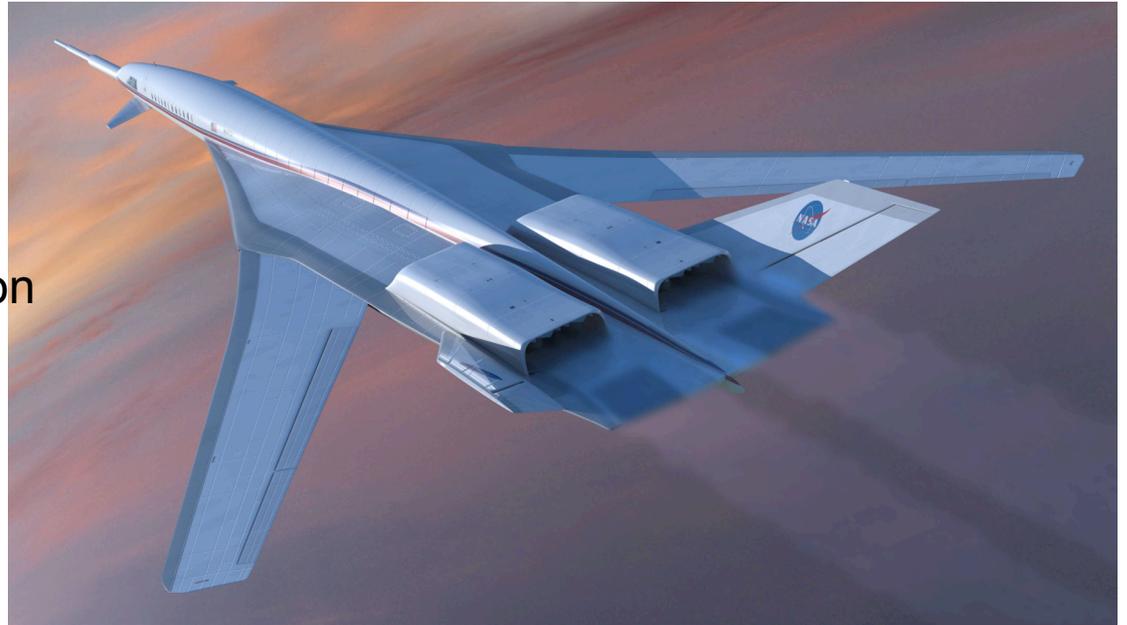
- Noise propagation predictions (on board)
  - Temperature profiles
  - Winds



# Supersonics

## Model inputs for predictions of boom propagation

- Temperature profiles
- Wind profiles
- Turbulence effects on propagation



## Environmental constraints on operations

- Contrail formation conditions at 44K-50K ft



# *Airportal*

- Airport operations
  - Low-level winds forecast to drive runway decisions
  - Convective Wx forecasts to minimize closure time and optimize routing assignments
  - Temperature, precipitation, and icing condition forecasts
- Wake prediction/visualization - to 1500 ft within 10 miles
  - Winds - speed and direction
  - Temperature
  - Turbulence Intensity
  - Precipitation rates
  - Windshift lines



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# Airspace

- 4D Wx Cube - Single Authoritative Source - text & image
  - Observations & Calculations - 220 parameter sets
  - Forecasts and probabilities - 146 parameter sets
  - History (18 hours)
- Wake prediction/visualization

JPDO Weather Functional Requirements  
Study Team

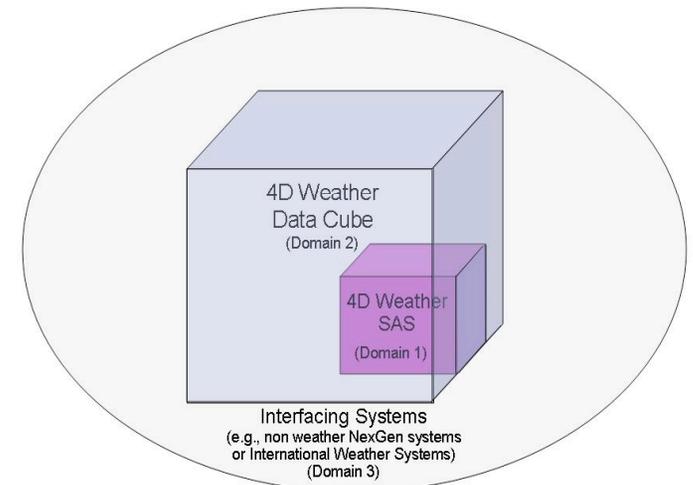
DRAFT

Four-Dimensional  
Weather Functional Requirements  
For  
NextGen  
Air Traffic Management  
Version 0.6



December 21, 2007

NexGen Four Dimensional Weather Data Cube  
Functional Requirements Study Team – Scope of Responsibility



# *Integrated Vehicle Health Mgmt*

- Damaging Conditions

- Volcanic Ash
- Humidity
- Icing
- Radiation

- Aircraft as sensor network



# *Integrated Intelligent Flight Deck*

- Display systems and Human factors
- Detection
  - Thunderstorms
  - Lightening
  - Winds
  - Icing
  - Precipitation
  - Radiation
  - Aircraft





# Weather

- More precise timing of hazard position
- Single Authoritative Source
- Distributed sensing and short-term forecasting
- UAS sensing network
- More data and forecasts for untowered/virtual-towered airports
- Broadened scope
  - Cosmic Radiation
  - Volcanic plumes
  - Transport data and forecasts for DHS

# Conclusions

- Aero's Wx needs are still evolving.
- JPDO Wx WG has drafted needs.
- Acoustics and Contrails are becoming big drivers.
- "Weather" is expanding.

